Patent Claims

1. Parking assistance for a vehicle, characterized in that the parking assistance permits autonomous driving or steering of a vehicle on a path for maneuvering into a parking space or assists a driver of a vehicle in a parking maneuver on the path for parking in the parking space, by means of a steering torque applied to the steering wheel, whereby the driver is guided by at least one artificial steering stop, preferably one or two artificial steering stops, on the path for driving into the parking space, and the measurement of the parking space is performed by a lateral distance measurement and a determination of position from signals from wheel rpm sensors and a steering angle sensor.

2. Parking space message module for a vehicle, in particular for a parking assistance according to Claim 1, characterized in that a parking space is measured by a lateral distance measurement and a determination of position from signals of wheel rpm sensors and a steering angle sensor.

3. Method for measuring a parking space for a vehicle, in particular for a parking assistance according to Claim 1, characterized in that the parking space is measured by a lateral distance measurement and a determination of position based on a steering angle, preferably using a steering angle measured by a steering angle sensor, and a change in path information, preferably the distance measured on the basis of wheel rpm sensors.

4. Parking assistance or parking space measuring module or method according to any one of Claims 1 through 3, characterized in that the determination of the parking space includes the following steps:
- approximate detection of corners of the objects or vehicles bordering the parking space, in particular the corners of vehicles in front of and behind the parking space,
- determining valid ranges for fronts of objects or vehicles bordering the parking space, in particular the vehicle fronts in front of and behind the parking space,
- determining the fronts of the objects or vehicles bordering the parking space, in particular the vehicle fronts in front of and behind the parking space, and
- calculating the corners of the objects or vehicles bordering the parking space, in particular the vehicle corners in front of and behind the parking space from these valid ranges.

5. Parking air or parking space measuring module or method according to any one of Claims 1 through 4, characterized in that the signals of the wheel rpm sensors are interrupt signals of the rear wheel rpm sensors of the wheels on the rear axle (rear wheels), and depending on these signals, preferably averaged, a change in path of the rear axle midpoint, in particular with regard to a cartesian coordinate system, is determined.

6. Parking assistance or parking space measuring module or method according to any one of Claims 1 through 5, characterized in that a cartesian coordinate system is

defined as a "global" cartesian coordinate system in an initialization phase for a parking procedure.

7. Parking air or parking space measuring module or method according to any one of Claims 1 through 6, characterized in that a change in path of the rear axle midpoint of the vehicle and a steering angle δ_{actual} measured by the steering angle sensor are calculated for a continuous determination of position and yaw angle (Ψ) in relation to a coordinate system sent at the start.

8. Parking assistance or parking space measuring module or method according to any one of Claims 1 through 7, characterized in that a current position of the vehicle is determined with the following steps:
- determination of a distance Δs by which the vehicle has moved since the last scanning step on the basis of the wheel rpm sensor signals and a scaling factor,
- calculation of the yaw angle Ψ_{actual} of the vehicle on the basis of the distance Δs so determined, the steering angle sensor signals and the wheel base l of the vehicle,
- determining the particular current yaw angle Ψ_{actual} by means of the recursive equation

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- determining the current actual x position x_{actual} and actual y position y_{actual} of the rear axle midpoint from the current yaw angle and the current steering angle.

9. Parking assistance or parking space measuring module or method according to any one of Claims 1 through 8, characterized in that on the basis of a continuously determined position and a continuously determined yaw angle (Ψ) in relation to a coordinate system set at the start and a distance d from the lateral distance measurement, an x-y position of the object surfaces bordering the parking space is calculated in relation to a global coordinate system.

10. Parking assistance or parking space measuring module or method according to any one of Claims 1 through 9, characterized in that the detection of the parking space and/or the object surfaces bordering the parking space is performed independently of stored values or interim values essentially only on the basis of a change in a distance d from the lateral distance measurement.

11. Parking assistance or parking space measuring module or method according to any one of Claims 1 through 10, characterized in that measured values and/or sensor signals of the lateral distance measurement and/or position determination are at least partially filtered.

12. Parking assistance or parking space measuring module or method according to any one of Claims 1 through 11, characterized in that a (global) cartesian coordinate system for a parking operation is defined and a tolerance range for the x coordinate, in which a corner of the objects or vehicles bordering the parking space could be situated, is preselected or determined as a function of

jumps in the distance value d at the beginning of the parking space and at the end of the parking space.

13. Parking assistance or parking space measuring module or method according to any one of Claims 1 through 12, characterized in that the fronts of the vehicles bordering the parking space (vehicle fronts in front of and behind the parking space) are determined from the measured values that are outside of the tolerance range and the vehicle fronts of the vehicles in front and behind are described in simplified terms by a linear equation, whereby these equations are each preferably determined by the method of least error squares.

14. Parking assistance or parking space measuring module or method according to any one of Claims 1 through 13, characterized in that the exact x position of the corner is determined from the deviations and the measured values from the straight lines thus determined.

15. Parking assistance or parking space measuring module or method according to any one of Claims 1 through 14, characterized in that the fronts of the vehicles bordering the parking space (vehicle fronts in front of and behind the parking space) are determined and the shape of the border of the path (curb) is deduced from the vehicle fronts thereby determined.

16. Parking assistance or parking space measuring module or method according to any one of Claims 1 through 15,

characterized in that determining the parking space comprises the following steps:

- Waiting for first parking space corner
- Passing the first parking space corner
- Defining a tolerance range for the first parking space corner
- Defining a range for a first vehicle front
- Calculating a linear equation for the first vehicle front
- Waiting for a second parking space corner
- Calculating the first corner
- Passing the second corner
- Defining a tolerance range for the second parking space corner
- Waiting on a valid starting range for a parking maneuver
- Defining the valid range for a second vehicle front
- Continuous calculation of the linear equation for the second vehicle front
- Continuous calculation of the second corner
- Calculating the forward trajectory